ICTRP

ICT Education and Training Analysis
Specialist Report

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Education and Training Analysis

Constraints

The Egyptian Government, through its newly articulated *National Project for Technology Renaissance* announced by President Mubarak, has encouraged the development of the *The National Communications and Information Technology Plan* prepared by the Ministry of Communications and Information Technology (MCIT). This comprehensive and ambitious national plan includes four primary objectives for the country of Egypt, using Information and Communications Technology (ICT) as a catalyst for social and economic development:

- the development of infrastructure and ICT content,
- the creation of a flexible "information society",
- the expansion of ICT systems as a tool for economic and social development, and
- increasing the number of qualified ICT professionals within Egypt.

To achieve some level of success in meeting these objectives, substantial investments must be made in human resources development. Education and training efforts to build capacity in Egypt will have a direct impact on the country's success in achieving each of these objectives. Yet significant institutional barriers exist which impede the expansion of a qualified ICT workforce.

The formal education system in Egypt is largely ill equipped to adapt to the substantive reforms necessary to address the training needs imposed by rapid changes in ICT. Eighteen percent (18%) of the Egyptian pre-collegiate students attend private schools[1] which highlights the perception that the public school system is largely under-funded with insufficient facilities and infrastructure, inadequate teacher training and salary compensation, overcrowding, and a inflexible curriculum unsuited to the rapid changes introduced by ICT as evinced in more developed countries.

Even with the additional and often substantial fees paid to private schools, few examples exist of any concerted efforts to integrate ICT in the curriculum which have resulted in wide-spread success. Achievement within the Egyptian undergraduate educational system is largely measured by exit examinations—at all levels—which emphasize rote memorization to the exclusion of critical thinking and synthesis skills. The existing school system has been

[1] Dr. Ali El-Hefnawi, *Senior Advisor to the Minister of Communication and Information Technology*, 6 June 2000.

characterized as "rigid and antiquated".[2] The Ministry of Education has not realized any significant progress in integrating technology skills–or even developing technology awareness–in the general education programs in the classroom. Education initiatives to create partnerships between Egyptian schools and foreign entities typically involve private schools; the Egyptian Ministry of Education is less responsive to such overtures.[3]

Egyptian institutions of higher education—under the governance of the Egyptian Ministry of Higher Education—have had some success in developing ICT programs. There are several universities offering high quality undergraduate and post-graduate degrees in Computer Science, but the majority of these programs are—by industry measures—either overly general or not sufficient up-to-date.[4] Because of the poor penetration of technology in the pre-collegiate system, post-secondary schools generally are required to concentrate on basic technology training in their foundation courses. Combined with a high student-to-computer ratio, limited access, and largely outdated hardware and software resources, the graduates of these programs are less prepared to adapt to the changing demands of the ICT profession. A recent agreement between Microsoft and the GOE to provide extremely low–cost software to college– and university students has been largely unsuccessful in early implementation, largely because the institutions have not seen the value of encouraging intellectual property rights (IPR) agreements, nor in promoting the value of such programs; this underscores the lack of widespread technology–use within post–secondary educational communities.

Several outstanding examples of post-graduate training institutes exist in Egypt, which underscore the success that can be achieved if these educational obstacles are addressed. These institutes, both private– as well as publicly–funded, have a demonstrated success in providing focused and content-specific skill based training that appears to meet the current ICT industry demands for qualified professionals. Through a combination of industry standard certification courses, post-graduate credential partnerships with foreign colleges and universities, partnering with industry employers for on-the-job (OTJ) training and internships, along with creative curriculum design, these training institutes foster "…special [ICT] training skills, emphasize creativity skills, and [OTJ] training at production sites…"[5] Such

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[2] *Empowering the Information and Communication Technologies Industry Sector in Egypt*, Development Informatics, Inc., Prepared for USAID, Egypt. January, 2000.
[3] Discussions with John Viste, *Chief of Mission*, ARD, Inc., Cairo, Egypt. 20 June 2000.
[4] *Main Factors Impeding Growth of Egyptian IT Industry*, Alexandria IT Business Association, May, 2000.
[4] *Information Technology in Egypt*, American Chamber of Commerce in Egypt, Business Studies and Analysis Center. August, 1998.

institutes typically target the "distinguished fresh graduate" in intensive six to nine month programs. In at least one such institute, tuition is underwritten by the government.[6]

An increasingly active segment of the ICT education and training sector in Egypt is business entrepreneurs who establish private training centers. These centers offer more limited ICT training focused on basic computer skills development as well as proprietary certificate courses. Certificate training programs in highest demand are Microsoft Certified Professional courses, network design and implementation training, and application-specific training, such as Oracle certification. These centers have helped double the number of Microsoft certificated individuals in the last two years to approximately 600 per year, and Microsoft has suspended licensing additional training centers in Cairo.[7] Indications are that there is insufficient market demand to absorb these certificated graduates, given the underdeveloped ICT market at present. There is some concern expressed that the graduates of these courses have insufficient depth of practical experience, and minimal business acumen, to be of value to companies needing guidance in the deployment of ITC in business organizations. Business leaders express the need to "certify" (or authenticate) the credentials of such graduates, given the increasing numbers of consultants in the industry claiming knowledge and possessing certificates, yet lacking fundamental and practical experience in ITC.

Several larger corporations, recognizing the potential supply of educated students for ICT-related fields, appear committed to the expansion of corporate training programs. Egyptian colleges graduate approximately 1.5 million students per year; it has been suggested that estimates of approximately 20,000 students per year might be qualified for further training in ICT.[8] Both IBM and the Government of Egypt (GOE) have announced the pending signature of an MOU to train 3,000 students—on a cost-shared basis—with facilities upgrades and a training of trainers beginning immediately. IBM expects to accept the top ten percent of students from this program to intern abroad for six months in IBM research centers, at their expense; three hundred interns per year are anticipated for this internship. Despite the emphasis placed on developing an Arabic-language ICT software development market in Egypt for export to the Middle East by the GOE, prevailing conditions in the ICT industry require strong English language skills; this is an identified need in all ICT education programs.

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[6] Information Technology Institute (ITI)

[7] *Information Technology in Egypt, Market Survey of Training Service Providers, Interim Report.* Community and Institutional Development (CID) 4 June 2000.

[8] Discussions with Dr. Amr Tawfik, *General Manager*, IBM World Trade Corporation, Egypt Branch. 12 June 2000.

Opportunities

The *National Communications and Information Technology Plan* recognizes the important investment in human-resources eduation and training required as a precondition for competitiveness in the ICT arena—the so-called "human touch." Several initiatives have been announced which may be viewed as opportunities to leverage in strengthening ICT in Egypt.

• *Youth Centers*

Initiatives have been announced to create a network of Youth Training Centers throughout Egypt, targeting youth under the age of 15 years. Immediate plans call for the construction of 120 centers, with full implementation by August, 2000.[9] Another 200 such centers are planned for next year. According to Dr. El-Hefnawi, these fee-based centers will be very low cost (50 piasters/hr.), as compared to existing "cybercafé" fees of LE 10-20 per hour. Computers have been purchased and sites have been determined for the first phase of centers. Opportunities exist to foster national ITC awareness through investment in training activities, network- and infrastructure-support, and marketing campaigns to encourage their use—especially in rural areas.

• *Computers in schools*

Few public schools have computer labs or wide-spread deployments of computers in classrooms; even privately funded schools have relatively few units made available to students. An impediment to the integration of ICT in the curriculum is teacher training and awareness. Teacher preparation programs do not adequately address the burgeoning role of ICT in education. Effective staff-development programs should be supported, and projects that focus primarily on access—combined with modest training programs—would be of benefit, if carefully targeted.

• *Training centers*

Public- and private training centers are a key opportunity to strengthen Egyptian awareness of ICT. The Ministry of Communications and Information Technology plans to establish fifty Technology Access Centers, a.k.a. *telecenters*, annually, to function as access points for ICT services. Internet Service Providers (ISPs) have deployed networks of cybercafés; some ISPs provide both formal and informal training opportunities that are of some value in promoting ICT use in the public sector. Under the auspices of the MCIT, mention has been made of the

[9] Dr. Ali El-Hefnawi. Op. cit.

use of the Egyptian Postal System offices as access points[10,11]; given the wide distribution of these offices into even the smallest of villages, pilot projects which promote access and awareness activities may be of strategic value—especially with regards to promoting equity access. This might also help disperse the predominate concentration of ICT activity from city centers into more rural settings.

• *Colleges and universities*

Colleges and universities in Egypt are making efforts to address the increasingly important need to incorporate ICT in education. Such activities are concentrated in the fields of engineering, science, and computer science—traditionally, early acquirers of technology. Institutions making investments in ICT include Cairo University, Alexandria University and Ain Shams University. Outside these specific fields of study, ICT penetration is especially weak. Given the extraordinarily high cost of computers for college students, combined with limited institutional access, graduates enter the workforce with comparatively poor ICT skills with respect to other more developed countries. In general, opportunities exist to provide greater faculty– and student access to technology; this might include targeted investment in computers and network infrastructure in libraries and media centers to strengthen ICT in higher education.

• *Public/private ICT training initiatives*

The ICT business sector has identified two primary outcomes for any development of ICT training programs: 1) increasing the number IT professionals skilled in best business practices and management techniques, and 2) the production of certifiably knowledgeable IT professionals with demonstrable experience in designing, implementing and managing ICT projects. Given the immediate needs of this business sector, the market has encouraged the growth of specific, short-duration, accelerated courses. The demand is being most successfully met through a mix of both private– and publically–funded entities.

These specific training programs address immediate market needs for people with useful skills in the near-term; however, given the rapidly–changing ITC industry, the fear exists that these skills may have limited value as the ITC environment evolves. Coupled with the limited awareness in Egypt of new emerging technologies, combined with an generally immature ITC market, there are indications that some training efforts are focused on topics which do not fulfill the industry's needs, or may be nearing the end of their utility within the market. There is a need to support these training groups by providing guidance in emerging

[10] Dr. Ahmed Nazif, *Minister of Communications and Information Technology*. Address to the American-Egyptian Chamber of Commerce (AmCham), 13 February 2000.
[11] Dr. Ali El-Hefnawi. Op. cit.

technologies, standards, and practices, so that both the course content, as well as the range of course offerings are appropriate.

Several exemplary models for training institutes exist which may result in disseminatible models elsewhere in Egypt[12]. Key indicators for their success lie in both the intensity and duration of their focus on technology. High concentrations of computers, accessible to students, combined with a project-oriented approach to learning, has produced encouraging results, and independent reports from the business sector confirms the quality of graduates from these institutes.

Opportunities exist to strengthen, support and replicate these institutes. Unfortunately, the intensity and short duration of these successful programs requires significant sacrifices by students, so these programs are dependent upon, and have been largely attractive to students, through their capacity to provide both tuition and cost-of-living support—along with successful job placement services. Further inducements include limited opportunities to continue study abroad in masters or doctoral study programs. These programs are also successful because of their ability to selectively recruit from the pool of available recent graduates—chiefly as a result of the substantial underwriting of costs from the public sector.

To achieve some positive outcomes within USAID/Cairo's Strategic Objectives (SO)—especially SO16 "Strengthening the environment for Trade and Investment" and SO17 "Workforce Skills Development", along with the Intermediate Results (IR) IR16.2 "Increased private sector competitiveness" and IR16.3 "Enhanced opportunities for business growth"—it is strongly recommended that these demonstrably successful institutes be used as the primary mechanism to provide training within the activities level of this RP. This activities could include the training and eventual staffing of the Telecommunications Regulatory Agency (TRA), strengthening the activities of the MCIT to support the ICT business sector, and the implementation of focused demonstration projects integrating ICT in public– and/or public–sector activities. Establishing partnerships with these existing training institutes through underwriting program development, student scholarship support, and internship incentives in the course of IR activities, would provide a viable channel for human–resources development crucial for program success.

• *Corporate training programs*

There is a need within the Egyptian ICT business sector to develop proprietary training programs for application–specific outcomes. Competent Microsoft–certified engineers, Cisco–trained networkers, Unix systems' administrators, and Oracle database analysts, are in high demand in the Egyptian ICT industry. Indications are—given the nascent stage of ICT

in Egypt—that some companies are hesitant to implement their own training programs, hoping to share the risk with the GOE or other partnering entities. The labor market in the Egyptian ICT industry is insufficiently mature to guarantee a loss of jobs to the global ITC industry, so expensive corporate training initiatives are carefully evaluated on a cost/benefit basis. Opportunities do exist to encourage companies to initiate such training, as evinced by IBM's pending cost–sharing training program with the MCIT, but if industry demand is strengthened it appears that corporate training programs will naturally increase without additional external encouragement.

Results Expected

To leverage the identified opportunities for ICT training in Egypt, several focused projects should become part of the outcome of the ICT Results Package (RP). These projects, also designated as "demonstration projects" would lead to a demonstrably improved ICT climate in Egypt over the next five years. Specific quantities of training activities are dependent on the final size, or amount, of such demonstration projects; based on a preliminary recommendation of the size of each project area, the below-detailed training activities give an approximate scale of training requirements which may need to be modified proportionally.

• Public-sector entities created/strengthened [Institutional Development, IR 16.3.1]

Demonstration projects

1. Creation of effective telecommunications regulatory agency (TRA)
    - 200 employees require technical training over four (4) years
        - trainer-of-trainers (TOT) program for 25 initial employees
            - contractor-led initial training program (six-month, 4-day/week)
            - concurrent management training component (six-month, 1-day/week)
        - recruitment and training of 175 employees, with on-the-job training provided by TOTs (six-month, 2-day/week)
    - Installation and deployment of internal ICT systems
        - Systems management training (15 employees, 25 days/year)
        - Technical support devision (10 employees, 10 days/year)
        - Applications and software development (10 employees, 20 days/year)

[12] *Information Technology Institute* (ITI) and the *Arab Academy for Science and Technology and Maritime Transport* (AAST).

- Data analysts, clerical and information systems specialists (100 employees, 5 days/year)

2. MCIT operations and staff strengthened and expanded, with procurement services computerized
   - 50 employees require technical training over four (4) years, with technical assistance from similar foreign-institution specialists (FCC, PTT, etc.)
     - 3-week visitations for key management personnel (10 persons, once per year)
3. Ministry of Health pharmaceutical procurement and inventory controls computerized
   - Three hospitals providing integrated medicine dispensing services
     - Health informations systems design and installation (6-12 months, turnkey systems implementation and support package, with training package)
     - Provide training and facilities development to support on-the-job training in systems use (5 TOT employees, 20 days/year initially, 10 days/year in subsequent years)
4. Ministry of Power inventory practices computerized to reduce duplication of parts warehousing
   - Ten (10) power/electric stations mantaining duplicate spare parts inventories networked with integrated inventory-control systems to control costs and reduce redundant stock, with rapid delivery system between sites.
     - Inventory informations systems design and installation (6-12 months, turnkey systems implementation and support package, with training package)
     - Provide training and facilities development to support on-the-job training in systems use (10 TOT employees, 15 days/year initially, 5 days/year in subsequent years)
5. Strengthen an increasingly independent telecommunications entity

• Opportunities for Disadvantaged Groups increased [Business environment, IR 16.3.2]

Demonstration projects

1. Youth Centers

- "Adopt" 20 centers to provide incubator programs with 40 program staff to develop youth activities focused on ICT awareness and use. Build programs with a focus on disseminatible use by other national youth centers. Activities include:
  – Youth Cybercafés
  – School-to-work partnerships and internships
  – Collaboration and support of postal system kiosk project [See below.]
  – Peer-tutoring programs and general literacy activities
- Technical staff training required, ongoing support
- Commodities (computers, software, supplies, etc.) and infrastructure required

2. Telecenters
   - Train and equip 10 telecenters, especially in medium-sized communities, to encourage small- and medium-sized business use of ICT.
     – Network and infrastructure support
     – Training and support to acquaint businesses with ICT use; courses, seminars, on-site training, Internet-, FAX- and software training, printing services.
   - Technical staff training required, ongoing support
   - Commodities (computers, software, supplies, etc.) and infrastructure required
3. Postal System kiosks (rural postoffices)
   - Develop feasibility study to create a network of 100 kiosks with Internet-based information services, especially governmental resources, with an emphasis on rural, disadvantaged and/or minority populations.
     – Develop support team to provide ongoing support (25 employee traveling tech support field team, with suitable hardware- and software troubleshooting training)
   - Technical staff training required, ongoing support
   - Use Youth Center, or Telecenter personnel, as local "first-line-of-defense" support cadre; also to provide community awareness and training on kiosk use
   - Commodities (computers, software, supplies, etc.) and infrastructure required
4. Computers in schools
   - Partner with three schools to install complete computer lab facilities
     – provide technical assistance to install wide- and local area networks

- support business alliances to provide software and training programs

5. College and university ICT training
   - Endow three college or university libraries/media centers with complete ICT access centers, staffed with support personnel
6. Public/private ICT training institutes
   - "privatize" successful ITI-like institutes, endow the institutes to provide scholarships and loans to underwrite student participation

Indicators of performance

Increased visibility of ICT in society, e.g., more advertisements with e-mail or web addresses

Number schools/students with net-presence increased